Chapter 8B: The Everglades Stormwater Program

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SUMMARY

The Everglades Stormwater Program (ESP) is charged with administering the non-Everglades Construction Project (non-ECP) permit, and developing and implementing strategies for achieving compliance with state water quality standards at structures that discharge into the Everglades Protection Area (EPA), but are not part of the ECP. The South Florida Water Management District's (SFWMD's or District's) water quality monitoring program indicates that the quality of water discharging into the EPA is generally acceptable, with the exception of phosphorus concentrations, dissolved oxygen, as well as pH and turbidity at a few sites.

The District continues to foster communication with local governments, special districts, Miccosukee and Seminole Indian Tribes, and other state and federal agencies to achieve the goals of the Everglades Forever Act (EFA), the Non-ECP permit and a future long-term compliance permit. Improved monitoring programs upstream of structures, which discharge into the EPA, have been implemented to identify "hot spots," or areas of water quality concern. Several cooperative/cost share agreements have been executed with local governments to implement water quality improvement plans consisting of monitoring, Best Management Practices (BMPs) and operational modifications. Public outreach initiatives have expanded to include public education and development of educational tools, such as turfgrass and landscaping BMPs, and an urban BMP development document for South Florida. A feasibility study has been initiated in conjunction with the ECP program to evaluate alternative combinations of private works and public works, including integration with the Comprehensive Everglades Restoration Plan (CERP), to achieve compliance with the long-term water quality standards for the EPA. These and other accomplishments as well as updates to ongoing activities are described in more detail in this chapter.

INTRODUCTION

This portion of Chapter 8 of the *2003 Everglades Consolidated Report* provides an update on the status and progress of the implementation of the Everglades Stormwater Program (ESP). On April 20, 1998, the Florida Department of Environmental Protection (Department or FDEP) issued the Non-ECP permit (FDEP File No. 06, 50259070). This permit was issued pursuant to Sections 9(k) and 9(l) of the Everglades Forever Act (EFA). The permit authorized the continued operation of water control structures operated, maintained and controlled by the District that

discharge waters into, within or from the EPA and that were not included in the permit(s) issued for the ECP. The Non-ECP permit requires that the District implement schedules and strategies to: (1) achieve and maintain water quality standards; (2) evaluate existing programs, permits and water quality data; (3) develop a regulatory program, where needed, to improve water quality; and (4) develop a monitoring program to track progress toward achieving compliance with water quality standards to the maximum extent practicable. The ESP elements, along with other District programs and activities, have previously been identified as the District's water quality improvement strategies for Non-ECP tributary basins and structures discharging into, within or from the EPA. The ESP elements were described in detail in Chapter 11 of the *2000 Everglades Consolidated Report*.

The first and most basic element of the ESP is the water quality monitoring and analysis program. The Non-ECP permit conditions require the District to document the accuracy of the data collected and measure progress toward achieving and maintaining compliance with state water quality standards by December 31, 2006**.** To fulfill permit conditions, the District has completed annually an analysis of water quality data at Non-ECP structures by comparing the data with state water quality standards.

To continue to document the accuracy of the data collected and measure progress toward achieving and maintaining compliance with state water quality standards, the District has compared water quality data at Non-ECP structures from May 1, 2001 through April 30, 2002 to state water quality standards. **Table 8B-1** provides a summary of flow-weighted mean total phosphorus concentrations at Non-ECP "INTO" structures for this period of record. Results of all water quality analyses in this year's report are included in **Appendix 8B-1**. A brief narrative summary of these analyses is also provided in the Water Quality Monitoring and Analysis section below.

The ESP portion of Chapter 8 of the *2003 Everglades Consolidated Report* also contains an update on the implementation of the 10-step Regulatory Action Strategy, water quality improvement initiatives, financial assessments, public outreach initiatives, an update of specific activities in ESP basins and a "findings" section.

Figure 8B-1 is an updated map of the ESP hydrologic basins and non-ECP structures. This map provides a wealth of regional information, including urban and tributary boundaries for basins associated with the ESP program and the location of non-ECP structures. This map depicts the location of ESP structures, the boundaries of ESP hydrologic contributing basins, the Everglades Agricultural Area boundaries (regulated by Chapters 40E-61 and 40E-63 of the Florida Administrative Code) and the EPA boundaries.

Previous ESP chapters of the *2001 Everglades Consolidated Report* included comparisons of quality assured water quality data at Non-ECP structures to state water quality standards. These analysis found that other than dissolved oxygen, there were very few excursions from Class III numeric water quality criterion for any parameter in all eight ESP contributing basins. It should be noted that the current Class III water quality standard for Dissolved Oxygen is under review by the DEP because excursions from that standard are often found in unimpacted south Florida natural water systems. It has been concluded in previous reports that water quality was generally acceptable in all eight ESP contributory basins, with the exception of dissolved oxygen and total phosphorus concentrations in three of the eight basins, the Wellington/Acme Improvement District, Feeder Canal, and L-28 basins.

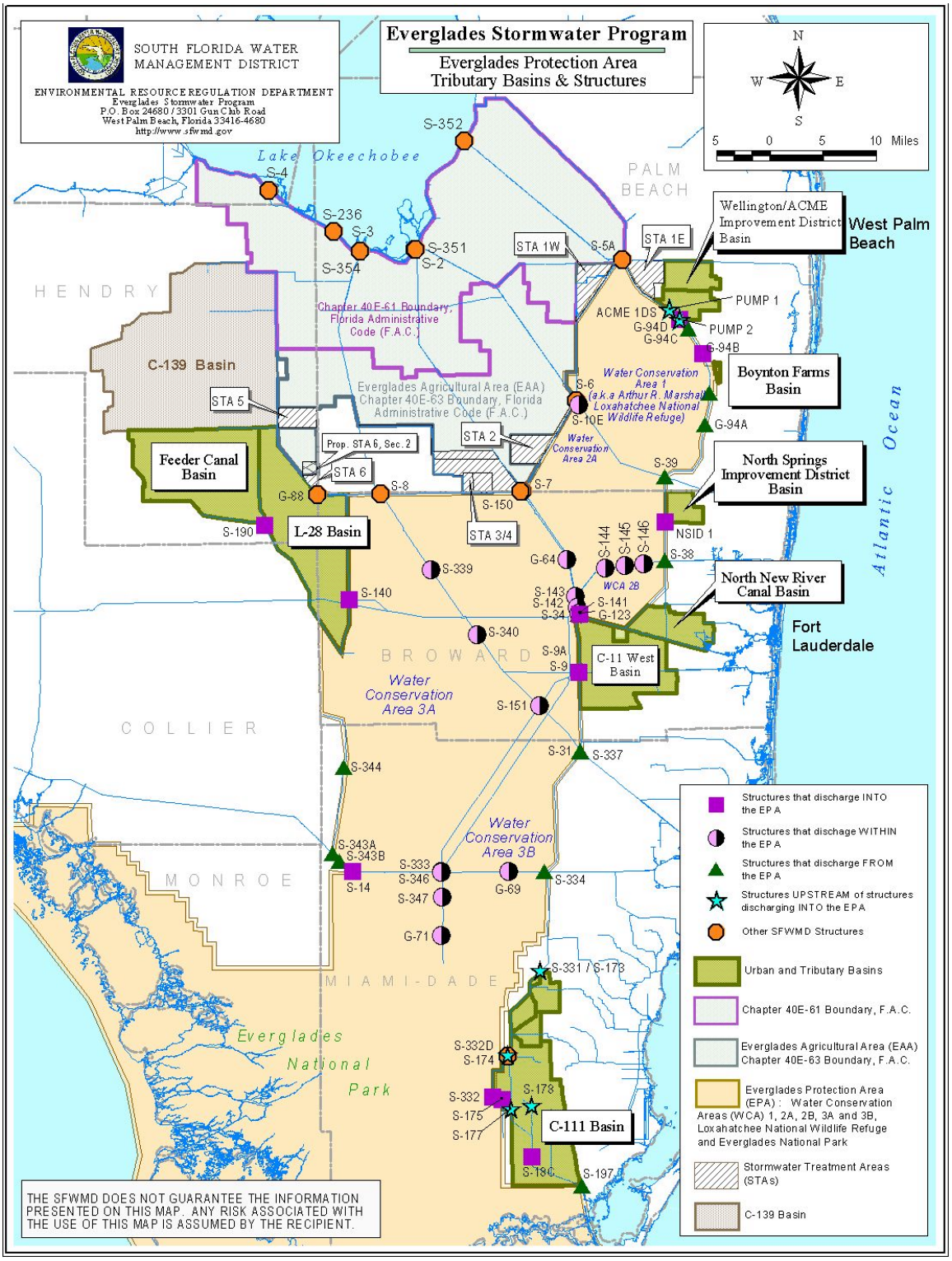

Figure 8B-1. Tributary basins, water control structures and other features related to the ESP

STATUS AND PROGRESS OF IMPLEMENTING THE ELEMENTS OF THE ESP

ESP WATER QUALITY ANALYSIS AND MONITORING PROGRAMS

The appendices to this chapter include an annual update of the non-ECP Permit monitoring program (Specific Condition No. 12), S-332D structure of C-111 basin, and a comparison of water quality data at Non-ECP structures to state water quality standards from May 1, 2001 through April 30, 2002 (Non-ECP fifth year's data). These comparisons fulfill non-ECP permit requirements to document the accuracy of the data collected and to measure progress toward achieving and maintaining compliance with state water quality standards. The data evaluations (physical parameters, nutrients, major ions, trace metals) indicated that from May 1, 2001 through April 30, 2002, with the exception of dissolved oxygen, a few excursions such as pH at S-145, turbidity at S-10E and S-178 from Class III water quality numeric criteria were found at non-ECP structures. The quarterly surface water and biannual sediment pesticide sampling during this period indicated that only three pesticides were detected in any of the analyses during this period. Diazinon was detected in two surface water samples at NSID1 pump station, chlorpyrifos (ethyl) was detected in one sample at S-177 and ethion was detected at one sample at S-176, respectively.

Table 8B-1 summarizes the flow-weighted mean Total Phosphorus (TP) concentrations, total flow volumes and TP loads at non-ECP into structures for the period from May 1, 2001 through April 30, 2002. As shown from the table, flows are relatively higher in WY2002 than in WY2001 for most of the structures, because WY2002 is a wet year compared with WY2001. This is the first time TP loads were presented in this consolidated report, therefore, the comparison with historical data can not be made. Flow-weighted mean TP concentrations vary greatly between basins. The highest TP concentrations are from ACME basin B, feeder canal basin, and L-28 basin. The North Springs Improvement District, North New River and C-11 West basins have TP concentrations below 50 μg/L. Although these concentrations are low, as discussed in Chapter 5, concentrations greater than approximately 10 μg/L will have to be addressed. The only basin that has a TP concentration below the potential default standard of 10 μg/L is the C-111 basin. Tropical Research and Education Center (TREC) of University Florida scientist are continuing their efforts for agricultural BMP research to reduce the nutrient loading. The TP data for the Everglades Protection Area, as a whole, is provided in Chapter 2 of this report.

Some of the highest TP concentrations (above 90 μg/L) for non-ECP structures discharging directly to the EPA during WY2002 were observed for the monitoring locations at the ACME2, G94D culverts, ACME1DS, and ACME1 pump stations. Weekly autosampler collection and biweekly grab samples at the respective upstream monitoring locations VOW1 (ACME Pump Station 1) and VOW2 (ACME Pump Station 2) were initiated in July 2000 based on a monitoring agreement between the District and the Village of Wellington/ACME Improvement District (VOW/ACME).

The ACME1DS and G-94D culverts, operated by VOW/ACME, remain open at all times and discharge to the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Refuge) when upstream pump stations ACME1 or ACME2 are operating. During WY2002, the VOW/ACME discharged more frequently than WY2001, District data collection trips (16) to the culvert monitoring locations resulted in a number of sampled flow events (9). The monitoring agreement with VOW/ACME resulted in a sufficient number (114) of samples collected by both grab and

autosampler upstream of the pump stations to cover a broad range of flows observed during pumping events, and therefore adequately characterize the TP concentrations.

Table 8B-1. Annual flow-weighted mean TP concentrations for WY2002 (May 1, 2001 through April 30, 2002)

Hydrologic Basin	Structure	Water Quality Station Id	Total Flow Volume (acre-feet)	Sample Size (Grab)	Number of Days with Positive Flow	Arithmetic Average (Grab)(µg/L)	Sample Size (Comp)	Sample Type	Total Samples Collected During Flow	Flow-Weighted [2] Mean Concentration (µg/L)	Flow-Weighted [3] Mean Concentration (ug/L)	TP Load (kg)
ACME (Basin B)	ACME1DS	ACME1DS	20,492 [6]	16	102 [6]	74	0	Grab [4]	9	96 [7]	95 [7]	2413
	ACME1	VOW1	20,492	21	102	80	27 [8]	Auto [5] & Grab [4]	114	90	86	2178
	G94D	G94D	22,222 [6]	16	106 [6]	92	0	Grab [4]	9	92 [7]	118 [7]	3229
	ACME2	VOW2	22,222	22	106	142	26 [8]	Auto [5] & Grab [4]	116	155	152	4169
North Springs Improv. District	NSID1	NSIDSP01	2,494	10	14	26	0 [9]	Grab [4]	6	26	26	80
		S-38B (WCA-2A near NSID1)	2,494	4	14	20	0	Grab [4]	0	ND[1]	16	49
North New River	G-123	G123	52,047	13	101	17	48 [8]	Auto [5] & Grab [4]	106	16	16	1057
C-11 West	S-9	S9	283,618	48	227	17	42	Auto [5] & Grab [4]	224	19	19	6716
C-111	S-175	S175	6	26	2	7	0	Grab [4]	2	7	5	0
	S-332	S332	0	26	0	6	0	Grab [4]	0	ND [1]	ND [1]	0
	S-18C	S18C	172,835	26	296	6	0	Grab [4]	21	5	7	1525
L-28	S-140	S140	109,994	16	189	46	52 [8]	Auto [5] & Grab [4]	201	47	48	6460
Feeder Canal	S-190	S190	84,982	16	223	60	53 [8]	Auto [5] & Grab [4]	236	90	89	9314
Boynton Farms	Various[10]	Various[10]	ND[1]	32	ND[1]	310-1781	ND[1]	Grab [4]	ND[1]	ND[1]	ND[1]	ND[1]

As shown in **Table 3** of **Appendix 8B-1b**, more than 75 percent of the data collected at the upstream VOW/ACME monitoring sites were below 160 ppb, with median TP values ranging between 69 and 130 ppb. Discharge data were not available for the ACME1DS and G-94D culverts. However, the discharge data during WY2002 from the upstream pump stations (20,492 acre-feet for ACME1 and 22,222 acre-feet for ACME2 respectively) can be used as an indication of the magnitude and occurrence of flow through the downstream culverts.

The feeder canal basin had flow weighted mean concentration of nearly 90 ppb (**Table 8B-1**) at S-190 with discharge of 84,984 acre-feet. As shown in **Table 3** of **Appendix 8B-1b**, more than 75 percent of the data collected at S-190 monitoring sites are below 86 ppb, with median concentration of 42 ppb for the autosamples and 41 ppb for the grab samples.

The ESP staff continues to work with the Seminole Tribe's Water Resource Management Department on a joint project with the Environmental Assessment and Monitoring Division of the District and the U.S. Geological Survey. This project included the installation of Ultrasonic Velocity Meters (UVMs) to estimate flow, autosamplers to collect composite water quality and grab samples at select locations based on watershed boundaries, land use, and discharge quantities. The operation of the S-190 structure, which is the main discharge location for the Feeder Canal Basin, will be coordinated with flows from the entitlement waters and has recently converted to flow proportional from timed sampling. The data reported from autosampler in WY2002 are still from timed sampling.

During WY2002, the water quality monitoring program has been ongoing in the Boynton Farm basin. Although access limitations and other boundary issues still exist, surface water quality samples for most of the identified "into" structures have been obtained during times of flow. Recently, the Williams Nursery pump on the north side of the Refuge was voluntarily removed. As part of the expansion work for State Road 7 to the east of the remaining farm properties, Lake Worth Drainage District is continuing in their efforts to provide sufficient capacity to allow all discharges from the remaining farms to go east. This would eliminate the need for these farms to pump west into the A.R.M. Loxahatchee National Wildlife Refuge.

The headquarters property is owned and operated by the U.S. Fish and Wildlife Service and is bordered by several farms immediately east of its boundary that discharge onto the property. The headquarters property is identified in the EFA as being within the boundary of the EPA, but is east of the protective levee, has no connection to discharge westward to WCA-1, and stands alone as an isolated parcel. Data were collected during WY2002 data for Amestory Farm includes sites BFBAFCP, BFBAFNP, and BFBAFSP; Dubois Farm include BFBDFCP, BFBDFNP, BFBDFSP and BFBDFWP; Mecca Farm includes BFBMFCP, BFBMFSP and BFBMFNP; Williams Nursery includes BFBWNCP. These are event driven grab samples with no associated flow measurements. The TP data are provided in **Table 8B-1,** which shows extremely high TP concentrations (mean concentration of 310-1781 ppb).

The G94A and G94B structures, when opened, allow interior Lake Worth Drainage District (LWDD) canals to fill, and the direction of flow has always been toward the LWDD canal system. The G-94C structure is operated in a similar manner.

The flow proportional autosampler, headwater pressure sensor, and calibrated flow monitoring equipment with telemetry that monitor NSID's pump station discharges into WCA-2A are functioning for North Springs Improvement District Basin (NSID). The surface water quality monitoring program has continued at NSID Pump Station (NSID1) during times of flow into Conservation Area 2A. Also, this year we have also obtained a significant number of

upstream water quality monitoring samples taken during times of flow. The NSID1 data can be found in **Table 8B-1**. The upstream data (NSIDSP01) can be found in **Table 8B-1**, **Table 3** of **Appendix 8B-1b**, and **Appendix 8B-1e**. Operation of the autosampler and telemetry equipment used to collect the data was delayed due to unforeseen pump repairs, but they have since been completed and pump testing was performed and pumps curves were developed and programmed into the equipment. All systems are now operational and should provide flow-weighted proportional sampling data results for WY 2003.

Reporting Requirements

As required by Specific Condition 5 of the non-ECP permit, the District is required to submit, on an annual basis, a report that includes a description and evaluation of the implementation of strategies and schedules contained in the permit, as appropriate. The annual reports are also required to include the results of the evaluation of water quality data, updates on the implementation of the Regulatory Action Strategy and the Mercury Screening Program. Information contained in this chapter and in other chapters of the *2003 Everglades Consolidated Report* fulfills the reporting requirements of the non-ECP permit as detailed in the specific conditions of the non-ECP permit. The requirements are listed below in **Table 8B-2**.

Table 8B-2. Non-ECP Permit Reporting Requirement

Specific Condition	Reporting Requirement	Location in Everglades Consolidated Report
4	New Permit or Permit Mods	Renewal Due April 2003
5	Submittal of Annual Report	Chapters 1, 2A,2B, 3, 4A, 4B, 4C, 7, 8A, 8B, 8C
6	Land Acquisition & Water Treatment Facility Status Update	Chapter 8B
7	First & Second Data Evaluation Reports	Completed in 1998 Annual Report
8	Regulatory Action Report	Chapter 8B
9	Update on Implementation of Schedules & Strategies	Chapters 1, 2A, 2B, 3, 4A, 4B, 4C, 7, 8A, 8B, 8C
10	CompQAP	CompQAP 870166G (DEP Approved)
11	Mercury Screening Program Report	Chapter 2A and 2B
12	Annual Report, Data Requirements	See Below
12(b)	Dates of Sampling	Appendix 8B-
12(c)	Water Quality Sampling Methodology	CompQAP 870166G (Sec's 6.0 & 7.0)
12(d)	Map of Sampling Locations	Chapter 8B, Figure 8B-1
12(e)	Statement of Sampling Authenticity	Appendix 8-
12(f)	CompQAP	CompQAP 870166G

Specific Condition	Reporting Requirement	Location in Everglades Consolidated Report
12(g)(I-v)	Water Quality Data & Associated Information	Appendix 8B-
12(g)(iv)	Monthly Flow Volumes	Appendix 8B-
12(h)	Water Quality Data Evaluation	Appendix 8B-
12(I)	Recommendations for Improving WQ Monitoring	Completed in 1998 Annual Report
12(j)	Implementation of Strategies	Chapters 1, 2A, 2B, 3, 4A, 4B, 4C, 7, 8A, 8B, 8C
16	Monitoring Locations Report	Submitted to FDEP in 1998
19	Additional Strategies (if Developed)	Not Applicable at this Time

Regulatory Action Strategy

The status of the Regulatory Action Strategy (RAS), which applies to all basins discharging into the Everglades Protection Area, but are not part of the ECP, is updated and submitted annually to the FDEP. A detailed description of the RAS and the 10-step approach to addressing basin-specific water quality issues are provided in Chapter 11 of the *2000 Everglades Consolidated Report* and in a new document titled *Everglades Stormwater Program Regulatory Action Strategy Status Report* dated August 2002.

Steps 1 through 3 of the RAS require an inventory of all structures directly discharging into the EPA (Step 1), the characterization of available water quality data (Step 2) and, when needed, an expanded monitoring program at structures discharging into the EPA (Step 3). At the time of this update, steps 1 through 3 of the RAS have been completed for all basins. Step 4 (evaluating data from direct structures) is ongoing, as additional data is collected. District staff had, ahead of schedule, analyzed all the District's data available since 1978 and presented it as part of the non-ECP Permit's first annual monitoring report on April 20, 1999 (SFWMD, 1999a). Autosampling equipment for flow-proportional TP sampling has been installed at the Wellington/ACME, North Springs Improvement District and C-11 West basin "into" structures. Autosampling equipment for time composite TP sampling has been installed at the S-18C "into" structure in the C-111 basin and the "into" structures for the North New River, L-28, and feeder canal basins. Additional equipment, necessary for flow-proportional TP sampling, has been purchased and installed for implementation this year. Step 5 (shift monitoring burdens for direct structures) has been completed at the Wellington/ACME and North Springs Improvement District basins. The only other structures that are not owned or operated by the District are the Boynton Farms structures. The District is continuing to monitor these structures to ensure collection of good quality data.

Steps 6 and 7 require the identification of structures upstream of the direct structures with potential water quality concerns and characterizing any existing data for these structures. Both of these steps have been completed in all basins where they are applicable. The basins are at varying stages of steps 8, 9, and 10. These steps require monitoring of upstream structures, evaluating the data for upstream structures and taking remedial actions, and shifting the monitoring burdens for upstream structures respectively. The District has executed cooperative/cost-share agreements

with local governments for upstream water quality monitoring within the Wellington/ACME, North Springs Improvement District, C-11 West, and North New River canal basins. Additional agreements will be pursued within these and other basins as needed. District personnel are conducting additional upstream sampling within the C-111, C-11 West, North New River canal, L-28 and feeder canal basins.

The cooperative agreements discussed above also include implementation of BMPs and operational changes to improve water quality. Also, a BMP incentive program has been initiated within the L-28 and feeder canal basins that will provide funds for landowners that meet specific requirements to implement BMPs. This program is being conducted in cooperation with the Hendry Soil and Water Conservation District and the NRCS. Implementation of water quality improvement plans, including BMPs and operational modifications, has been partially initiated in the L-28, feeder canal, C-11 West, North Springs Improvement District, and Wellington/ACME basins (see the "Updates of Activities in ESP Basins" section of this chapter for more detailed information on each basin).

Water Quality Improvement Plans

In FY 2000, the District began a process that will lead to the development of basin-specific alternative analysis/conceptual designs for tributary basins discharging into the EPA. The activities associated with this effort include six non-ECP basins and all basins associated with the Everglades Construction Project. The goal of this effort is to provide alternatives analysis and conceptual designs that identify the best combination of Best Management Practices, optimized STAs and Advanced Treatment Technologies needed to meet the final water quality and water quantity objectives for the benefit of the Everglades. The first part of this process, alternative analysis, is near completion. Alternatives have been developed and analyzed on a feasibility level. Meetings with stakeholders are being conducted to determine preferred alternatives prior to completion of conceptual designs. See the "Achieving Long-term Water Quality Goals" section of this chapter for more information.

Agreements with local stakeholders (municipalities and water control districts) within the C-11 West, North New River canal, North Springs Improvement District and the Wellington/ACME basins have been executed requiring the local stakeholders to develop and implement BMPs where feasible. The District has provided in-kind services, expertise and funding to aid these initiatives. Also, a BMP incentive program has been initiated within the L-28 and feeder canal basins that will provide funds for landowners that meet specific requirements to implement BMPs. This program is being conducted in cooperation with the Hendry Soil and Water Conservation District and the NRCS. Additional agreements and coordination with other agencies and landowners in other basins are being pursued. Upstream water quality monitoring data being collected will help determine the location and type of BMPs that should be implemented.

The Comprehensive Everglades Restoration Plan (CERP) includes several components that will have a direct impact on the activities of the ESP (Chapter 7). Staff from ESP have coordinated and contributed to the Water Preserve Area (WPA) Feasibility Study (covers several Non-ECP basins), the Wellington/ACME Basin B Project Delivery Team (PDT), and the C-111 North Spreader Canal PDT. Additional coordination will occur as planning activities for individual CERP components are initiated. In addition, ESP staff is coordinating with ECP research staff on Advanced Treatment Technologies to determine the applicability in the non-ECP basins and the WPA components.

The District has entered into a cost-share agreement with the United States Department of Agriculture-Agricultural Research Service (USDA-ARS) to perform research of BMPs to protect groundwater and surface water from agricultural chemicals in southern Miami-Dade County. The goal of this research is to determine pesticide and nutrient loading to groundwater from normal farming practices and evaluate the efficacy of summer cover crops as a BMP for vegetable crop production. This research is near completion and the results and recommendations will be disseminated to the southern Miami-Dade County farm community through the University of Florida's Tropical Research and Education Center (UF-TREC).

FINANCIAL ASSESSMENTS

A conceptual methodology for calculating a financial assessment based on the benefit each parcel may receive has been developed and is currently under review. This methodology would require a higher assessment per acre from land uses that generate a larger loading of pollutants relative to other land uses within the drainage basin. The methodology would use GIS to identify the size, land use, ownership and existence of permitted treatment facilities for each parcel within a basin. GIS mapping in the Wellington/ACME Improvement District basin is near completion and additional mapping in the North Springs Improvement District, North New River canal and C-11 West basins is continuing. A pilot test of the methodology and GIS mapping has been completed within basin B of the Wellington/ACME basin. Results of this test will be used as part of a comprehensive review of funding sources for Everglades' restoration activities without dedicated sources of revenue. This review includes policy issues and decisions regarding the sources of revenue. It is unclear how this financial assessment methodology will fit into these policy decisions, if at all. While these issues are being resolved, mapping within the basins will continue, as well as technical and policy review of the calculation methodology.

Public Outreach Initiatives

The public involvement campaign has continued to expand. The campaign includes websites, Best Management Practice (BMPs) documents, workshops, and various activities in the C-11 West basin, the ESP pilot basin for public involvement activities.

Numerous meetings have been and will continue to be held with stakeholders in the ESP basins. At these meetings, the EFA deadline for meeting the future standard for phosphorus in 2006 is emphasized. In addition, District staff communicates the integrated nature of other District programs with the ESP and other agencies' programs.

The ESP Website has been completed and will be located on the District's Website. The site includes basin information, such as maps, publications, photos, project information and basin program updates. The ESP has a summary document describing the program in layman's terms. A copy in pdf format may be found at the District's Website at http://www.sfwmd.gov/org/reg/evg/espsum/espsum2000.pdf.

The ESP staff completed the Urban Stormwater Best Management Practices document. The document discusses sources of pollutants, targeting and quantifying pollutant types, as well as methods for selecting feasible BMPs, and provides information on structural and nonstructural BMPs for urban land uses. A copy in pdf format may be found at the District's Website at http://www.sfwmd.gov/org/reg/evg/bmp manual.pdf.

Public involvement activities are continuing in the C-11 West basin. The activities include a variety of strategies aimed at educating stakeholders and the public to implement changes that

will result in enhanced water quality and reduced phosphorus content in the stormwater discharges.

The *Turf & Landscape Best Management Practices Manual*, developed by a 36-member working group, was posted on each of the Work Group Member Websites. The Working Group includes landscaping interests, fertilizer industries, government agencies, colleges, universities, special interest groups and environmental organizations. The agreed-upon messages in the *Turf & Landscape Best Management Practices Manual* will be used to develop retail displays, complimentary fliers and other promotional pieces. Group members have been soliciting speaking engagements to promote the manual throughout the basin, and have promoted the effort in their respective newsletters and publications. This manual will also be used as a guide for local government ordinances designed to improve water quality within municipalities. A hard copy version of this manual will be available in the fall of 2002.

The District has been instrumental in forming the *Freddy's Friends Club* and the *Teddy's Friends Club*, the District's and Central Broward Water Control District's mascots, respectively, for the students at Silver Ridge Elementary School and Cooper City Elementary School. These clubs provide education activities related to water quality improvement and water conservation. In addition, various educational presentations related to the C-11 West canal and its water quality have reached approximately 2,000 local elementary students.

PROGRAM MANAGEMENT AND IMPLEMENTATION

UPDATES OF ACTIVITIES IN ESP BASINS

Wellington/Acme Improvement District Basin

Through a cooperative agreement between Wellington and the District, a water quality improvement plan has been implemented. The plan includes implementation of BMPs, operational changes in the local water management system and development of several alternatives to resolve water quality concerns in the Basin B area. As a result of this agreement, the Village of Wellington has created a BMP ordinance that addresses the storage, handling and transport of livestock waste and the storage and application of fertilizer. The ordinance includes an educational component on the proper use of fertilizers and irrigation practices. Wellington has also implemented several maintenance BMPs within its canal right of ways, including raised inlets, sediment sumps, sediment removal and canal vegetation harvesting. Upstream monitoring has identified "hotspots" within basin B. The District will be working with Wellington to develop remedial measures to address these "hotspots."

The Project Delivery Team (PDT) for the Wellington/ACME basin B component of the CERP has been initiated and is in the Project Implementation Report (PIR) development phase. This phase develops and selects alternatives and completes the federal NEPA process. The information provided in the Basin Specific Feasibility Study to Achieve Long Term Water Quality Goals will be used in the PIR phase to accelerate the technical review process. ESP staff and Wellington staff are members of the PDT.

ESP staff has been coordinating with the Surface Water Management staff to encourage additional water quality treatment and BMPs in new Environmental Resource Permit applications. The staff has been successful in issuing permits that exceed the required water

quality treatment criteria and include innovative BMPs designed to reduce discharges of nutrients into the Wellington canal system.

In 2000, ESP staff coordinated with District research staff and Wellington to implement a Chemical Treatment and Solids Separation (CTSS) pilot study within basin B (located at Acme pump station 2 near G-94D). The pilot study trailer used is one of the same trailers used for the CTSS pilot study done in the Everglades Nutrient Removal Project. This pilot study was conducted to determine the feasibility of chemical treatment of stormwater in a more urban basin. The study indicates that TP levels of 10 ppb or less can be achieved using this technology (Chapter 4). A new, larger scale CTSS demonstration project is to be conducted in 2003 within basin B. This demonstration project is designed to address large scale design issues that were identified during the previous pilot study.

Boynton Farms Basin

The water quality monitoring program in this basin is continuing. Although access limitations and other boundary issues still exist, surface water quality samples for most of the identified "into" structures have been obtained during times of flow. The results of these analyses can be found in the appendices. Recently, the Williams Nursery pump on the north side of the Refuge headquarters property was voluntarily removed.

The Refuge headquarters property is owned and operated by the U.S. Fish and Wildlife Service and is bordered by several farms immediately east of its boundary that discharge onto the property. The headquarters property is identified in the EFA as being within the boundary of the EPA, but is east of the protective levee for WCA-1, has no connection to discharge westward to WCA-1, and stands alone as an isolated parcel. The Lake Worth Drainage District is continuing in their efforts to provide sufficient capacity to allow all discharges from the remaining farms to go east. This would eliminate the need for these farms to pump west into the Refuge headquarters property. The District will continue to offer technical support to help landowners comply with the requirements of the Everglades Forever Act.

North Springs Improvement District Basin (NSID)

The existing cooperative agreement between the District and NSID continues to be effective in meeting the goals of the Everglades Stormwater Program in this basin. The flow proportional autosampler, headwater pressure sensor, and calibrated flow monitoring equipment with telemetry that monitor NSID's pump station discharges into WCA-2A are functioning as designed. The surface water quality monitoring program is continuing at NSID pump station 1 during times of flow into Water Conservation Area 2A. This year NSID has also obtained a significant number of upstream water quality monitoring samples taken during times of flow. The NSID pump station 1 data can be found in **Table 8B-1** and in the appendices along with upstream data.

The upstream data indicate areas where sources of phosphorus are potentially higher and therefore identify "hot spots" where implementation of stormwater best management practices and public outreach will be most effective. The agricultural lands in the north sub-basin showed the highest concentrations of total phosphorus. he property owner intends to develop these lands into residential and golf course use, which should result in an improvement in water quality based on the lower levels of phosphorus found in the current residential and golf course areas and the additional water management areas proposed.

North New River Canal Basin

Pursuant to Steps 9 and 10 of the RAS, the District has executed three additional cost share agreements within this basin. The agreement with Plantation Acres Improvement District includes a monitoring program as well as determination and implementation of Best Management Practices (BMPs). The city of Sunrise has one outfall to the North New River canal, which has been monitored by the District for the last 18 months, therefore, their agreement concentrates on determining hotspots and implementing BMPs, with an emphasis on public education. The agreement for the Bonaventure sub-basin is with the city of Weston and includes a sampling program and BMPs. Old Plantation Water Control District will be enhancing their original agreement, signed in September 2001, to include determination and implementation of appropriate BMPs, including public education initiatives. The arithmetic average for TP at the G-123 pump station remains below 18ppb.

C-11 West Basin

A cooperative/cost share agreement between Indian Trace Development District (within the city of Weston) and the District was executed on May 30, 2002 for implementation of a water quality monitoring and improvement program. Identification of "hot spots" and implementation of BMPs will be determined from the data collected. The District has continued to work closely with Central Broward Water Control District and South Broward Drainage District to implement cooperative/cost share water quality monitoring and improvement agreements within the C-11 West basin. Results from upstream monitoring reveal TP concentrations generally ranging from 7 ppb to 50 ppb. Concentrations higher than 50 ppb are primarily associated with areas that have predominantly agricultural and/or nursery land uses.

The District research staff implement a Chemical Treatment and Solids Separation (CTSS) pilot study within the C-11 West basin (located near S-9 pump station). The pilot study trailer used is one of the same trailers used for the CTSS pilot study done in the Everglades Nutrient Removal Project and the Wellington/ACME Improvement District basin. This pilot study was conducted to determine the feasibility of chemical treatment within the C-11 West basin. The study indicates that TP levels of 10 ppb or less can be achieved using this technology.

The Western C-11 Basin Critical Restoration Project was authorized in the Water Resource Development Act as "a water quality improvement project essential to Everglades restoration." Accordingly, the project has been identified as an important part of the District's overall strategy for achieving and maintaining water quality standards for "non-ECP" structures as required by the Everglades Forever Act (Chapter 373.4592(9)(k)(1)(a), Florida Statutes). Completed in late 2002, Phase I of the critical restoration project, pumping station S-9A, was a seepage control structure that replaced the S-9 pump station's role of backpumping seepage losses from WCA-3A. S-9A, a four-bay pump station, has two 175 cfs diesel engine driven pumps and two 75 cfs electric motor driven pumps. The smaller pumps will operate continuously and will maintain C-11 West canal elevations between 3.2 and 3.5 feet NGVD. This is a much narrower range of variation than that maintained by the larger S-9 pumps which now operate during both storm and non-storm conditions. The operation of these smaller pumps will also reduce bottom scour and drawdown experienced in C-11, which are caused by the operation of the larger S-9 pumps. Since the bottom scour and large amount of drawdown caused by the operation of the large pumps result in re-suspension of suspended material that often contains significant quantities of phosphorus, reduction of these factors should reduce the levels of phosphorus entering the EPA.

Under the project cooperative agreement between the District and the Army Corps of Engineers, the District has agreed to accept responsibility for operation of the facility and acquisition of all necessary permits required for operational authorization. Accordingly, on August 31, 2001 the Florida Department of Environmental Protection issued the District a modification of the existing non-ECP permit (FDEP File Number 06,502590709) for operational authorization of the S-9A pump station. An autosampler has been installed at the new S-9A pump station and its results will be included in future reports.

Phase II of the Western C-11 Basin Critical Restoration Project is a 2-gated spillway/divide structure (S-381), which is currently scheduled for completion in 2003. The S-381 structure will act as a canal divide to separate the urban area to the east of the structure from the more natural areas located to the west of the structure. When both phases of the critical restoration are completed, cleaner seepage water will be returned at S-9A back into WCA-3A at the same rate it enters the 7,900 foot reach of the C-11 canal from the S-9A to the S-381 gated structure.

The Public Outreach Initiatives section above discusses several outreach activities which are being conducted within the basin to encourage residents to reduce the sources of pollutants entering the C-11 West canal.

C-111 Basin

A monitoring program is currently being implemented in this basin to meet the requirements of the biological opinion issued by the U.S. Fish and Wildlife Service (USFWS) in 1999 to protect the Cape Sable seaside sparrow (CSSS). The monitoring program and emergency operations to protect the endangered CSSS are being spearheaded by the Army Corps of Engineers (Corps). The Interim Operating Plan (IOP) has been completed and outlines the operations pursuant to the water management targets in the biological opinion.

An autosampler has been installed at the S-178 structure. This structure is an upstream structure within the C-111 basin and has been identified as needing improved water quality data to accurately characterize the quality of water within this sub-basin. As discussed in the Water Quality Improvement Plans section, research continues in this area on pesticide and nutrient transport and groundcover BMPs.

L-28 Basin

The ESP staff continues to work with the Seminole Tribe's Water Resource Management Department on a joint project with the Environmental Monitoring and Assessment Division of the District and the U.S. Geological Survey. This project included the installation of Ultrasonic Velocity Meters (UVMs) to estimate flow, autosamplers to collect composite water quality and grab samples at select locations based on watershed boundaries, land use, and discharge quantities. The automatic sampler currently onsite at the S-140 structure is scheduled to be converted from time to flow proportional sampling within the next year. Scheduled completion for a canal to convey the tribe's established entitlement of water (47,000 acre-feet/year) via the recently constructed S-409 pump station will be completed by January 2003.

The Natural Resource Conservation Service (NRCS) has assisted with the completion of conservation plans for the Seminole Tribe of Florida and the Miccosukee Tribe of Indians of Florida's reservations located in the L-28 Basin. The designs of NRCS conservation plans and implementation of on-farm BMPs have been completed by both tribes on a voluntary basis. The ESP staff will continue to include the development and implementation of BMPs for row crops,

citrus, beef cattle, and other agricultural practices in the basin. Upstream water quality monitoring will gauge the effectiveness of these BMPs and indicate where farm conservation plans may need adjusting.

In order to maximize basin participation and provide incentives to improve water quality, the District has proposed a volunteer program for the three western basins consisting of the feeder canal, L-28, and C-139. This program is funded with $100,000 in FY 2002 and additional requests of $100,000 each year for the next two years will provide total funding of $300,000. Future year funding is dependent upon District budget approval by the governing board. The program proposes to conduct informational workshops, informal site visits and the cost sharing of Best Management Practices (BMPs) while coordinating closely with landowners to prepare BMP Plans for implementation. The District has been granted the option to enter into a cooperative agreement with a state or federal agency to disburse funds to landowners upon implementation of recommended BMP Plans. This program is anticipated to result in an immediate reduction in nutrient loads entering the Everglades Protection Area (EPA). The District has entered into a cooperative agreement with the Hendry Soil and Water Conservation District (HSWCD) to administer the volunteer incentive program.

Feeder Canal Basin

The ESP staff continues to work with the Seminole Tribe's Water Resource Management Department on a joint project with the Environmental Assessment and Monitoring Division of the District and the U.S. Geological Survey. This project included the installation of Ultrasonic Velocity Meters (UVMs) to estimate flow, autosamplers to collect composite water quality and grab samples at select locations based on watershed boundaries, land use, and discharge quantities. The automatic sampler currently onsite at the S-190 structure is scheduled to be converted from time to flow proportional sampling within the next year. The tribe's established entitlement of water (47,000 acre-feet/year) is to be conveyed via the recently constructed S-409 pump station. The operation of the S-190 structure, which is the main discharge location for the feeder canal basin, will be coordinated with flows from the entitlement waters.

The District, in partner with the Natural Resources Conservation Service and several other government agencies, share information and provide support to local landowners in developing voluntary BMPs. Workshops to provide education on BMPs, available landowner assistance programs, and guidance in developing on-farm conservation plans is expected to be on-going. The District will continue to evaluate water quality within this basin by initiating a sampling program for upstream discharges to the S-190. The objective of these data will be to either confirm the level of success from present BMP's or to highlight the need for additional BMPs.

To maximize basin participation and provide incentives in improving water quality, the District has proposed a volunteer program for the three western basins consisting of the feeder canal, L-28, and C-139. This program is funded with $100,000 in FY 2002 and additional requests of $100,000 each year for the next two years will provide total funding of $300,000. Future year funding is dependent upon District budget approval by the governing board. The program proposes to conduct informational workshops, informal site visits and the cost sharing of Best Management Practices (BMPs) while coordinating closely with landowners to prepare BMP Plans for implementation. The District has been granted the option to enter into a cooperative agreement with a state or federal agency to disburse funds to landowners upon implementation of recommended BMP Plans. This program is anticipated to result in an immediate reduction in nutrient loads entering the Everglades Protection Area (EPA). The District has entered into a

cooperative agreement with the Hendry Soil and Water Conservation District (HSWCD) to administer the volunteer incentive program.

FINDINGS

That portion of the District's water quality monitoring program implemented as a result of the EFA and the non-ECP permit indicates that the quality of water discharging into the EPA is generally acceptable, with the exception of phosphorus concentrations discharging from the Wellington/ACME, feeder canal and L-28 basins, which has flow weighted mean total phosphorus concentrations above 48 ppb. Flow-weighted mean total phosphorus concentrations were 19 ppb for C-11 West basin, 16-26 ppb for North New River and North Springs Improvement District. With a potential phosphorus numerical standard of 10 ppb, these basins will be required to implement appropriate water quality improvement measures. To better characterize the quality of water discharging into the EPA, the District has implemented a plan to install flow-proportional automated samplers at all "into" structures.

After cursory reviews of existing water quality monitoring programs upstream of the direct "into" structures, it appears necessary to revise existing programs and implement new programs where none currently exist to better characterize water quality within the basins. Revised monitoring programs within the Wellington/ACME, C-11 West, North New River canal and North Springs Improvement District basins have been implemented. Recommendations for implementation of new water quality programs and revisions to existing programs are also being developed in other basins. Concurrently, the District will continue to monitor water quality in accordance with the non-ECP permit to measure progress toward achieving compliance with state water quality standards.

To achieve the goals/requirements of the EFA, the non-ECP permit and the future Long Term Compliance Permit, extensive coordination with local governments, 298 special districts, the Miccosukee and Seminole Indian Tribes and other state and federal agencies is essential. Several meetings have been conducted to foster this coordination within all the basins. Several cooperative/cost-share agreements with local governments have been executed to implement water quality improvement plans consisting of BMPs and operational modifications. The public involvement element of the ESP will provide additional avenues of participation for environmental groups, agricultural and urban communities, locally impacted industries and the general public. Coordination with CERP, the Water Preserve Area Feasibility Study, ongoing critical projects within non-ECP basins, the Basin-Specific Feasibility Study discussed in Chapter 8A and local governments is facilitating the development of long-term solutions for achieving statewide water quality standards.

LITERATURE CITED

The Non-ECP Structures First Annual Monitoring Report. 1999a. Submitted to the Florida Department of Environmental Protection pursuant to the EFA Permit No. 06, 502590709, South Florida Water Management District, West Palm Beach, FL.

The Non-ECP Structures Second Annual Monitoring Report. 1999b. Submitted to the Florida Department of Environmental Protection pursuant to EFA Permit No. 06, 502590709, South Florida Water Management District, West Palm Beach, FL.

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